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ISR FAST Site

To: Nelson Chester, ISR Review Group Leader
From: Peter Levchenko, Manager, and Richard Breedon, Deputy Manager, ISR FAST Site
Subject: RE: Results of the ISR Readiness Review held on February 27, 2003

Below are listed the Recommendation extracted from N. Chester's report on the ISR Readiness Review. Our written responses, as requested, follow in italics. We apologize for not meeting the requested end of March 2003 deadline as one of the respondents (Richard) has only recently returned to CERN.

Recommendations:
The Review Team identified no major deficiencies in the configuration, setup, and operation of the ISR activities, but offers the following recommendations in order to achieve continued success:

1. An individual should be identified who will periodically check all ISR shared equipment to insure that it remains in proper functioning condition for our needs.
   Two persons, Andrei Vorobiev and Alexander Baldychev, have been identified to carry out checks of all CSC-specific and ISR-shared equipment including the forklift, 6T small crane, and electric tools. Specifically, they and others have been trained and certified in proper operation and inspection of the crane. These checks are performed periodically and any irregularities are reported to P. Levchenko for appropriate action.

2. All documents prepared and displayed at the ISR review should be converted into working procedures and instructions that are kept in both books that are available to the ISR Team and on the ISR Web Page so that others may refer to them as needed. Safety related requirements should be added to all procedures as required (see below).
   All documents prepared and displayed at the ISR readiness review have been updated, edited, and posted on the Web site at http://cmsdoc.cern.ch/cms/CSC/CERN/isrrr/isrrr.html. A description of general safety considerations for the ISR site has been prepared by R. Breedon and A. Lanaro (see accompanying document). Safety practices specific to individual ISR site tasks have been added to the relevant documents. A bound paper copy of many if the instructional and informational documents relevant to ISR activities is available at the ISR worksite, and it will be completed soon.

3. The documents in item #2 should be used along with "on-the-spot training" to train team members how to do various jobs efficiently, accurately, and safely. The cross training of various individuals to do the same job is encouraged.
   Cross training has been encouraged and documents for individual jobs are available for reference at the ISR site. One example of effective cross training regards the recent departure of A. Shchetkovsky, who had been responsible for performing the "A" set of tests. His replacement, Anatoli Petrunin, trained with him for several days and studied the documentation, and progress in the "A" tests has continued without interruption.

4. The ISR team members described needed tools and equipment that were not fully in place or operational. We encourage the team to obtain these needed items by the end of March. Peter and Richard are asked to further explore alternate simple and efficient procurement methodologies that will allow the team to procure needed items easily without the difficulties of getting reimbursed.
   Immediately following the review the list of existing and required tools and equipment was completed by N. Bondar and A. Vorobiev. In the past weeks, nearly all necessary tools and equipment have been obtained. A summary table of all ISR tools may be found at http://cmsdoc.cern.ch/cms/MUON/csc/fast/INFO-POOL/Tooling/tooling.html . Those with an EDH account and password may obtain details of tool purchases and other financial aspects under the team code T247700 on http://cet.cern.ch/ .
   Still outstanding is a rectangular spreader bar that would assist the moving of all sizes of CSC crates with the crane. V. Razmyslovich prepared drawings of a proposed design of such a spreader bar. D. Loveless offered that PSL could produce construction diagrams of the bar, which would be built at CERN. Before

construction, all drawings and relevant calculations will be presented to the TIS safety officer Mr. Laurent Colly, tel. 78764 or 16-0644 for approval.

5. Peter and Richard are encouraged to refine the organization structure to eliminate to the extent possible the job overlap of many people doing many jobs, yet still preserving the cross training of individuals so that there is more than one trained person capable of doing any one job. Particularly for repairs and alignment plate installation, personnel who are trained and capable of performing these operations should be identified.
   A copy of the updated ISR site organizational structure is included in Appendix 1 and is also available at http://agenda.cern.ch/fullAgenda.php?ida=a03532 in the talk "ISR Status."
   The observation of " job overlap" was made because of the repeated listing of the same names under different tasks. This was because these individuals perform preparatory work that is common to more than one task. Since the review, people at the site have carried out their tasks efficiently and on schedule with no noticeable job overlap. The procedures to follow for repairs and special tasks have been worked out and included in the instructions. People have been assigned to carry out these tasks. R. Breedon is responsible for alignment plate installation and is waiting for additional plates to be sent to CERN.

6. The Team members are reminded that when any repairs are made to the chambers or chamber components, or when parts are replaced, the details of the problems encountered and the details of the repairs or replacements made, should be documented for statistical analysis, archival purposes, and future reference. A list of approved types of repairs with basic procedures has been provided to the ISR team. The documentation should be submitted by systematic inclusion in the CMS ISR database as well as on the CMS ISR website. The preferred method of communication and notification among individuals is by email.
   Reports on problems encountered are summarized on a Excel spreadsheet that is regularly updated on the Web at http://cmsdoc.cern.ch/cms/MUON/csc/fast/test_stat/problems/ . Any suggested repair procedure is first presented by email to the Repair Committee and, if necessary, discussed during the weekly Integration videoconference and approval is sought before it is put into practice.

7. New or previously non-existent problems that are encountered along with proposals for fixing them should be presented to the Repair Committee for assessment and corrective action direction. Communication should be in writing (email) and all correspondence containing problem identification, recommendations for correction, and the final results obtained should be kept in the database as well as on the website in a systematically consistent form that is easy to understandable and read. If a problem or issue turns out to be recurring, then it should be added to the list of visual inspections or otherwise to the list of inspections or tests that are done on all chambers. Updating of existing documentation should then follow and notification should be made to all concerned.
   See previous response. Copies of the "CSC Mechanical Inspection" checklist and the "Chamber Test B" checklist accompany this document.

8. Safety precautions, instructions, inspections, and other elements related to the health of all personnel and the safety of personnel and equipment should be documented on the website as well as included in the operating procedures and instructions.
   Safety precautions have been identified and instructions prepared, both for general ISR concerns and for specific tasks. The general safety document is available at
   http://cmsdoc.cern.ch/cms/MUON/csc/fast/INFO-POOL/Misc/General_Safety.htm
   Also, see comment under point 2.
   A poster describing ISR safety risks prepared by C. Schaefer has been posted at the ISR work site and may be viewed at http://cmsdoc.cern.ch/cms/MUON/csc/fast/INFO-POOL/Misc/blue_poster_ISR.pdf .

9. A number of repair and special procedures to be performed on chambers (e.g. alignment plate installation) have already been identified as being needed on some or all chambers. Descriptions of where and how these repair and special operations are to be performed should be written and maintained in books available to the ISR Team, as well as placed on the Web and in the Database. The descriptions should define the tools and equipment that are needed to perform these tasks, and describe the location of where needed equipment is kept or stored.
   This has been done and described under earlier points above.

10. An overall work schedule has not been presented, although individual time estimates for various operations have been provided. In conjunction with the receiving schedules of chambers and parts to the ISR, and in conjunction with the most up to date delivery schedule of these items to SX5, a flow chart or plan depicting the anticipated work flow in ISR should be created and kept up to date as work progresses. This work plan

and activity flow chart should show the time required to carry out the particular jobs and should show the personnel required for all operations.
Preparation of an overall work schedule is in progress and will be put on the ISR Site Web site.

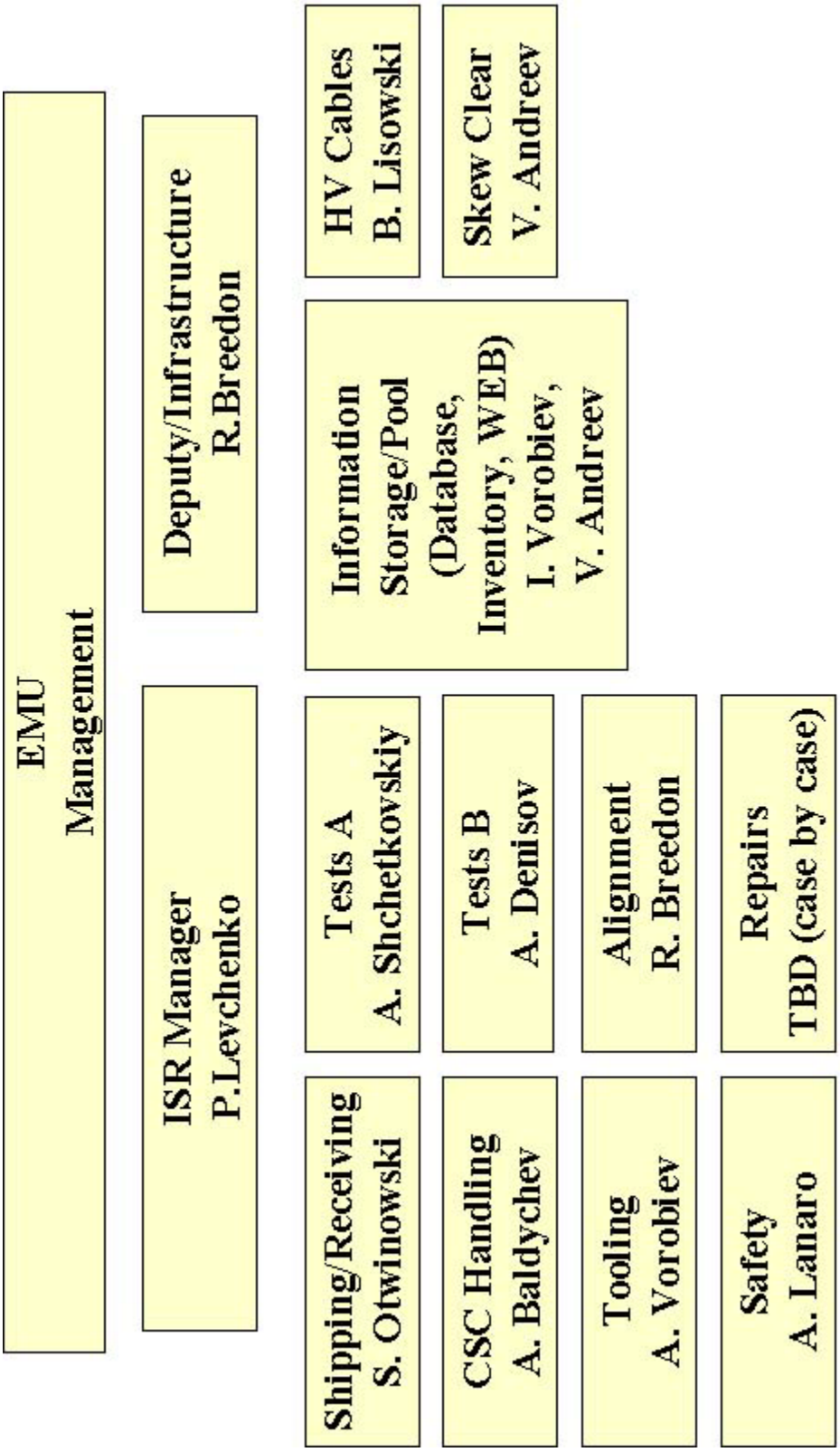
11. The choice of pre-determining the particular chambers that are to have alignment hardware attached as presented to the reviewers appears to be inappropriate. It is suggested that perhaps one out of five or six chambers evaluated should have the appropriate alignment hardware attached, and then when put back into a crate, the crate be appropriately marked to show that alignment hardware has been attached. These crates should then be separately stored such that they can easily be identified and obtained when required for delivery to the SX5 personnel.
A work area separate from the Test A and B areas has been prepared by A. Denisov, A. Baldychev, P. Efimov, V. Golubev, and M. Alidra for gluing the alignment plates on selected chambers. It is Richard's understanding from R. Loveless that it does not make any difference which CSCs have plates attached to them as long its crate is marked, so no "pre-determining the particular chambers that are to have alignment hardware attached" appears to be necessary. So far only one plate has been affixed and two plates are available at the ISR. We now have the correct glue and are waiting for additional plates to be shipped to CERN.

Follow-up Action Item:
The Review Team kindly asks Peter and Richard, on behalf of the ISR Team, for a written response to the above recommendations. Your response should include the action to be taken for each numbered recommendation and the anticipated completion date. We would like to have your response no later than the end of March, 2003.

Review Team:

Giorgio Apollinari
Richard Breedon
Nelson Chester (Leader)
Yuri Ivanov
Chunhua Jiang
Andrey Korytov
Armando Lanaro
Richard Loveless
Sergei Lusin
Guenakh Mitselmakher
Vladislav Razmyslovitch

Appendix 1. ISR Organizational Chart



R. Breedon,
University of California, Davis
A. Lanaro
University of Wisconsin, Madison

CERN ISR Fast Site

General Safety Procedures

Safety procedures to be followed by people working at the ISR FAST site

General Safety Procedures

Safety procedures to be followed by people working at the CERN ISR FAST site

Introduction

While certain tasks performed in the ISR have specific safety concerns, there are certain safety guidelines that are to be followed by anyone performing any task at the Endcap Muon ISR FAST site.

We have been informed by the CMS Deputy GLIMOS, Christoph Schaefer that they intend to write a safety manual for CMS activities in the ISR. Until that exists, the intent of this document is to point out some special concerns about safety in the ISR, some of which were highlighted at the February 20, 2003 meeting with Christoph Schaefer. In addition, there are general safety guidelines on the TIS webpage.

Special ISR concerns. It is important to remember that while originally a proton-proton colliding storage ring, since the mid-1980's the ISR has been a storage area. Thus, as it was not designed for long-term occupation and was previously a radiation environment, there are special considerations to be kept in mind. It is now being converting for use as a laboratory, but many safety aspects are still inadequate for such use, such as fire alarms and lighting for emergency exits.

> *We have been told that smoke detectors will be installed in our working area in the ISR, but no date has been set and the money to pay for them does not seem to exist. For a regularly occupied space, the emergency exits are too far apart, so some emergency lighting should be installed.*

With these concerns in mind, safety should be the top priority for all activities in the ISR.

- In an emergency call 74444.
- The CMS Territorial Safety Officer (TSO) is Daniel Arevalo. The CMS Group Leader in Matter of Safety (GLIMOS) is Reiner Schmidt soon to be replaced by Christoph Schaefer.
- Periodic inspections of the ISR area are to be expected meant to control the status of equipment and installations, as well as methods and working conditions.
- Consult the CERN Safety guidelines outlined in http://tis.cern.ch/

General ISR Safety Procedures

The most common accidents at CERN (about 60%) involve falling, tripping, or being hit on the head. Keep safety in mind when organizing your work area. In addition, there are the following special concerns for the ISR area:

Never work alone

As a general rule, staff must not work alone where a significant hazard exists. For any task, a minimum of 2 person are required to be present together in the ISR for the obvious reason that if one gets hurt the other can come to his/her assistance (TIS Safety Code **A6**).

No smoking

The ISR is a tunnel, so not even a designated smoking area is permitted (TIS Safety Instruction **IS46**).

No eating

Eating or drinking is not allowed in the ISR except in a designated "closed off" area separated from the work area by cabinets or a screen.

Safety shoes and general individual protection

Safety shoes are required to be worn by anyone operating the crane or any lifting equipment. Additional safety equipment for individual protection should be used depending on the risks involved in any particular activity (TIS Safety Instruction **IS7**).

Radiation precautions

The ISR is a low-level radiation area. Of special concern is the former Beam Stop area, where only regular 8-hour/day work is approved. No sleeping in the ISR is permitted.

Central escape zone

A straight path of width 1.5m through the center of the ISR tunnel is always to be kept clear for fire evacuation safety (TIS Safety Code **F**). Typically, it is desirable that 4.5m through the center be kept clear.

Miscellaneous hazards

We share the ISR space with other activities: be watchful for alignment laser tests (TIS Safety Instruction **IS22**), high/low voltages on other detectors, flammable gas for the RPCs, and heavy transport activities.

Chamber shipping & receiving

Lifting equipment and handling accessories

Prior to any chamber delivery to ISR and/or shipping from ISR the lifting equipment (crane, hoists, lifting platforms) and the handling accessories (slings, lifting beams, harnesses) should undergo a throughout inspection and/or test (TIS Safety Code **D1**). The coordinator should ensure that the crew members are aware of personal safety requirements (safety shoes, gloves, helmets) and property protection during their work. Suitable training should be envisaged for new crew members. Upon request by the coordinator, a Safety Officer (GLIMOS or Deputy) should attend the operations.

Only authorized personnel can operate the lifting equipment. It is forbidden to use non-conform lifting equipment and/or handling accessories.

Any event occurring on a CERN site, outside the Laboratory in the course of duty or in the course of travel to or from different Lab sites, must be reported for reasons of prevention of recurrence and considerations of insurance.

Chamber Testing

General Safety requirements

This note summarizes the safety regulations to be adopted to ensure individual and property protection during any chamber testing procedures.

The handling of chambers inside ISR should be done according to the rules described in the note "Chamber shipping and receiving".

Electrical installations

Electrical installations should be conform to IEC or CENELEC standards (TIS Safety code **C1,** Instruction **IS28**). Electrical cables must conform standards associated with smoke, toxicity and corrosiveness requirements (TIS Safety Instruction **IS24**). All power sources (HV and LV) should be suitably labeled (TIS Safety Instruction **IS33**). The test area should be confined and marked. Electrical installations (power racks, inactive metal parts) should be interconnected and properly isolated (grounding requirements). The operating personnel should be trained and informed on existing risks or dangers. In case of accidents personnel should be aware of the nearest location of first-aid and fire-fighting safety equipment.

Gas installations

Gas installations and their operation and maintenance should be conform to CERN safety regulations. Gas installation (gas distribution rack, pressurized pipelines, pressure vessels, gas connections, exhausts, installation material, etc.) should be inspected by the (local) Safety Officer. Gas containers should be stored in gas houses located outside ISR (TIS Safety Instruction **IS42**). Flammable gas installations will require a risk area classification and a special inspection procedure from CERN/TIS (TIS Safety Code **G**). Flammable gas detecting head and gas retention bags are required near the gas distribution system.

Testing with radioactive sources

Chamber testing using radioactive sources should comply with CERN radioprotection safety regulations. The use of film badge or dosimeter is required when handling radioactive sources in a confined test area. Storage of radioactive sources should be done in protected areas agreed by the Safety Officer/TIS.

Chemicals

The improper use of chemicals might be of serious personal and environmental danger (TIS Safety Code **B,** Instruction **IS49**). Manipulation, storage, transport and disposal of chemicals must proceed according to the regulations outlined in the Chemical Safety Manual. Disposable masks should be worn for personal protection against toxic vapors, handling should be done with protective gloves (polyethylene) and safety goggles. All containers for chemicals should be labeled, tightly closed and properly stored away from heat. To avoid damaging of experimental equipment (chambers) and personal hazard use small quantity of chemicals in a well ventilated area (TIS Safety Code **A4**). In case of accidents personnel should be aware of the nearest location of first-aid equipment.

Suggested first aid

Eye contact*: Immediately flush eyes with large amount of water for at least 15 minutes. Get immediate medical attention.*

Skin contact*: Immediately wash skin with soap and water. Remove contaminated clothing. If sign/symptoms occur, call a physician.*

Inhalation*: If sign/symptoms occur, remover person to fresh air, and then call a physician.*

Swallowing*: Do not provoke vomiting. Drink water, and then call a physician.*

ISR Tooling & Equipment

All tasks performed at ISR involve the use of tools and experimental equipment. Some of the tools could be custom made in the fast site laboratories subjected to different safety regulations. It is recommended that all tools and materials used at ISR fulfill CERN safety rules or have received TIS authorization via special derogation (TIS Safety Instruction **IS41**). It advisable to provide a record of the material data sheet for the safety documentation.

Laboratory equipment and common use tools should be inspected for proper condition before undergoing experimental activities. Damaged or mal-functioning tools should be reconditioned or replaced.

Warning

Always check the material properties. Some materials available at the CERN store are NOT certified by TIS.

Chamber mechanical inspection before DAQ test

Date _____Site _____ Chamber type: ME ___/_ Chamber number _____

1. Overall visual inspection

☐ Inspect the chamber for any visible mechanical damages after transportation (deformation, scratches, cracks etc.). If any electronics cover is damaged, remove the cover and inspect the boards under the cover. All damaged board must be replaced with spare.

Comments:

2. Gas inlet/outlet

☐ Wiggle the outlets left/right parallel to the chamber surface.

☐ Special brass ***nut*** and ***ferrule*** attached to the gas outlet.

Comments:

3. Loctite

☐ Apply Loctite 290, independently of what you find in step 2 (see Instructions XXX)

Comments:

4. Screw tightness

Chamber side covers have M6 screws with washers. Use 10 mm screwdriver socket and a torque wrench. The maximum allowed torque is 24 lb/inch. In case of broken threat use special tools and instructions for repairing the threat (XXX).

☐ Cathode (wide) side (e.g., 12 screws for ME234/2)

☐ HV connector side (e.g., 34 screws for ME234/2)

☐ Chamber narrow side (e.g., 16 screws for ME234/2)

☐ Anode Readout side (e.g., 34 screws for ME234/2)
Remove AFEB cover to open the chamber side cover (e.g. 12 screws for ME234/2). And leave it open.

☐ Cooling plate screws - use 5 mm Hex screwdriver.

Comments:

Comments:

☐ AFEB-ALCT cables strain relief bar - use 5 mm Hex screwdriver

☐ AFEB-ALCT cables strain relief (green) - use 8 mm screwdriver socket and a torque wrench. The maximum allowed torque is16 lb/inch.

☐ LVDB and AL CT cover - use Phillips #2 screwdriver.

Comments:

5. CFEB input cable inspection. Take off CFEB cover (use Phillips #2 screwdriver).

☐ Inspect visually the input cable connection order, the input cables integrity (isolation @connectors damages), CFEB input connectors integrity. Use a flash light for inspecting cable connection on the chamber side.

Comments:

6. CFEB output connectors

☐ If the chamber has CFEBs with locked screws on the output connectors, just insure that everything is OK.
If the chamber has CFEBs with loose and/or not fixed screws on the output connectors, you must tighten screws and apply loctite 290. Follow procedure XXX (B.Bilsma).

Comments:

☐ Put on CFEB cover (use Phillips #2 screwdriver).

7. AFEB inspection

☐ Check AFEB fixation screws. Use Phillips #1 screwdriver (option flat 3 mm).

☐ Check AFEB bracket M4 screws. Use 7 mm screwdriver socket and special cordless screwdriver (Black and Decker). Allowed torque is pointed on the attached label.

☐ Check the cable grounding lag tightness.

☐ Check cable connection and cable position - cable must go along the AFEB side. Cables should not go over latches. (Use the cable installation instructions XXX).

☐ Put on AFEB side cover (12 screws for ME234/2). Use 10 mm screwdriver socket and a torque wrench. The maximum allowed torque is 24 lb/inch

Comments:

8. ALCT inspection

Take off the ALCT covers. Use Phillips #2 screwdriver.

☐ Check tightness of the ALCT and the ALCT MB fixation screws and nuts. Use 5mm socket, Hex screwdriver 3 mm, Phillips screwdriver #2.

☐ Check integrity of the ALCT input connectors (missing latches, broken-off plastic pieces)

☐ Check cable connections (all cable connectors must be properly inserted and latched)

☐ Check cables position - all cables must go between connectors. Cables should not go over latches.

☐ Check AFEB-ALCT cable (Jacket integrity, harness tightness).

☐ Check connection of the ALCT test cables (6 blue RF cables).

☐ Put on the ALCT cover above the input cables (MC000022A). Use Phillips #2 screwdriver.

Comments:

9. LV cable harness

☐ Inspect the harness. The obsolete version of the harness must be replaced with new one (the obsolete one has no cable labels)

Comments:

10. DAQ cable connection.

☐ Connect all DAQ cables to the corresponding CFEBs and ALCT

☐ Connect LVMB control cable. Set all switches on the LVMB to the LOW position.

☐ Connect HV cable.

Comments:

Note: All electronics covers must be closed for tests with power "ON".

Date: _____ Operator:_____

☒ Signature_____

Chamber Test B

Date_____ Site _____ Chamber type: ME ___/_ Chamber number _____

Time

_____ . Visual inspection pass ☐ _____

Comments:

Basic set of DAQ tests

_____ Test #9. Slow control functions of LVDB_LVMB, ALCT, CFEB ☐ _____

Comments: 1.TEST#9----------
2.CFEB PROM's loaded, OFF/ON-------
3.CFEB User ID ------- -------- -------- -------- -------- DB ID ------- ------- ------- ------- -------
4. CFEB pedestals (Test 15)----------

_____ Test #16 CFEB Connectivity Run # ☐ _____

Comments:

_____ Test #13 AFEB Threshold and Analog Noise Run # ☐ _____

Comments:

_____ Test #13b ALCT Verification Run # ☐ _____

Comments:

_____ Test #12 AFEB Connectivity Run # ☐ _____

Comments:

_____ Test #15 CFEB DAQ-Path Noise Run # ☐ _____

Comments:

_____ Test #11 AFEB Counting Noise without HV Run # ☐ _____

Comments:

Tests which require High Voltage

Check first the chamber gas mixture. Set HV to 3600. V **Note. For CERN FAST site HV = 3550 V**

_____ Test #11 AFEB Counting Noise Run # ☐ _____

Comments:

_____ Test #18 CFEB Comparator Counting Noise Run # ☐ _____

Comments:

Other Tests

Tests must be performed if Chamber was fixed or replaced CFEB, AFEB, ALCT during tests at ISR

_____ Test #17a CFEB Calibration (delay scan) Run # ☐ _____

Comments:

_____ Test #17b CFEB Calibration (amplitude scan) Run # ☐ _____

Comments:

_____ Test #19 CFEB Comparator Threshold and Analog Noise Run # ☐ _____

Comments:

_____ Test #20 CFEB Comparator Output Timing Run # ☐ _____

Comments:

_____ Test #21 CFEB Comparator Logic Run # ☐ _____

Comments:

_____ Test #14 AFEB-ALCT Time Delay Run # ☐ _____

Comments:

_____ Test #25 ALCT Self-Trigger (with HV) Run # ☐ _____

Comments:

_____ Test #26 CLCT Self-Trigger (with HV) Run # ☐ _____

Comments:

_____ Test #28 ALCT and CLCT rate vs. HV ☐ _____

H V	ALCT	CLCT
3100		
3150		
3200		
3250		
3300		
3350		
3400		
3450		
3500		
3550		
3600		
3650 3700 3750	_____ _____	_____ _____

Comments:

Operator _____

Date _____ Signature _____

EXPERIMENT OR GROUP: CMS

DETECTOR AREA / ZONE DETECTEUR: **BEAM:** ISR I3/I4 **TEL.:**

DATE: 20.02.2003

COUNTING ROOM / SALLE DE COMPTAGE: **TEL.:**

SIGN. GLIMOS:

PARTICULAR HAZARDS / DANGERS SPECIAUX:

Flammable Gas, High Voltage, Heavy Transport, Heavy Water, LASER

PERSONS TO CALL IN CASE OF EMERGENCY:
PERSONNES A CONTACTER EN CAS D'URGENCE:

RESPONSIBILITY / RESPONSABILITE	NAME / NOM	TELEPHONE CERN	TELEPHONE HOME/PRIVE
GLIMOS	Reiner Schmidt	71526	
FGSO (Gas)	Christoph Schäfer	160202	0450401329
Secretariat	Marie-Claude Pelloux	74539	

AREA CONTR. ROOM / SALLE DE CONTR. DE LA ZONE:

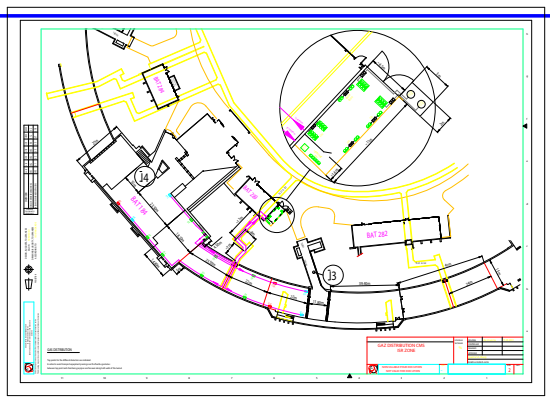
TERRITORIAL SAFETY OFF. / DELEGUE A LA SECURITE TERRITORIALE:
NOM: Daniel Arevalo **TEL.:** 163004 **PRIVE:**

LOCAL RADIATION PROTECTION / RADIOPROTECTION POUR LA ZONE:
NOM: Marco Silari **TEL.:** 160640 **PRIVE:**

SAFETY ENGINEER (TIS) / INGENIEUR SECURITE (TIS):
NOM: Jean-Claude Carlier **TEL.:** 160878 **PRIVE:**

MAINTENANCE , DEPANNAGE: 72201

LAY-OUT PLAN



ACCIDENT ⟷ **FIRE / FEU**

112 OR OU **RED/ ROUGE**